

DEP SPECIFICATION

EQUIPMENT CRITICALITY IN PRESSURE VESSEL DESIGN

DEP 31.22.00.30-Gen.

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DESIGN AND ENGINEERING PRACTICE

DEM1



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The information set forth in these publications is provided to Shell companies for their consideration and decision to implement. This is of particular importance where DEPs may not cover every requirement or diversity of condition at each locality. The system of DEPs is expected to be sufficiently flexible to allow individual Operating Units to adapt the information set forth in DEPs to their own environment and requirements.

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TABLE OF CONTENTS

1.	INTRODUCTION	4
1.1	SCOPE	4
1.2	DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS	4
1.3	DEFINITIONS	5
1.4	CROSS-REFERENCES	6
1.5	SUMMARY OF MAIN CHANGES.....	6
1.6	COMMENTS ON THIS DEP	6
1.7	DUAL UNITS.....	6
1.8	NON NORMATIVE TEXT (COMMENTARY).....	6
2.	GENERAL	7
2.1	BACKGROUND AND OBJECTIVES	7
2.2	DESIGN CLASS VERSUS SHELL VESSEL CATEGORY	7
2.3	WORK PROCESS	8
3.	CRITICALITY TABLES	9
3.1	INSTRUCTIONS FOR USE OF TABLES	9
3.2	MODIFICATION OF VESSEL CATEGORY	10
3.3	CRITICALITY TABLES	10
3.4	TABLE CRITERIA.....	11
4.	REFERENCES	17

1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and give recommendations for defining equipment criticality categories that are to be applied during equipment design and fabrication.

The categorization is based on the criticality of the equipment as assessed against the following:

- Operational risk-loss of containment and loss of production risks.
- Design complexity-high operating temperatures and pressures, potentially high corrosion rates, hydrogen service.
- Fabrication complexity-complex materials of fabrication, heavy wall, complex internals, postweld heat treatment (PWHT) requirements, clad vessels.

DEP 31.22.00.31-Gen. specifies design, fabrication, inspection, and testing requirements for pressure vessels based on the vessel criticality category resulting from this DEP.

This DEP is applicable to heat exchangers, unless the heat exchanger is supplied as part of an original equipment manufacturer (OEM) equipment package (e.g., lube oil heat exchangers on rotating equipment skid packages).

This DEP is not applicable to atmospheric pressure storage tanks.

This DEP contains mandatory requirements to mitigate process safety risks in accordance with Design Engineering Manual (DEM) 1-Application of Technical Standards.

This is a revision of the DEP of the same number dated February 2014; see (1.5) regarding the changes.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by Shell GSI, the distribution of this DEP is confined to Shell companies and, where necessary, to Contractors and Manufacturers/Suppliers nominated by them. Any authorised access to DEPs does not for that reason constitute an authorization to any documents, data or information to which the DEPs may refer.

This DEP is intended for use in facilities related to oil and gas production, gas handling, oil refining, chemical processing, gasification, distribution and supply/marketing. This DEP may also be applied in other similar facilities.

When DEPs are applied, a Management of Change (MOC) process shall be implemented; this is of particular importance when existing facilities are to be modified.

If national and/or local regulations exist in which some of the requirements could be more stringent than in this DEP, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable with regards to the safety, environmental, economic and legal aspects. In all cases, the Contractor shall inform the Principal of any deviation from the requirements of this DEP which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned, the objective being to obtain agreement to follow this DEP as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party that carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party that manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party that initiates the project and ultimately pays for it. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The word **shall** indicates a requirement.

The capitalised term **SHALL [PS]** indicates a process safety requirement.

The word **should** indicates a recommendation.

The word **may** indicates a permitted option.

1.3.2 Specific definitions

Term	Definition
Cyclic Service	Pressure equipment subject to frequent fluctuations in pressure and/or temperature, mechanical vibration or external loading that may lead to damage from fatigue. Severe cyclic service refers to equipment that requires a fatigue analysis as part of the detailed design assessment.
Hydrogen Service (H₂ Service)	Service in which the hydrogen partial pressure is greater than 700 kPa absolute (100 psia) at any temperature. See also API RP 941, Figure 1.
Pressure Vessel	Vessel used for containing, storing, distributing, processing or otherwise handling an expansible fluid under pressure. This excludes rotating or reciprocating equipment, fired heaters, and piping.
PWHT	Post weld heat treatment; aimed at reducing hardness and residual stresses in welds.
Very Toxic (Substances)	A substance that is very hazardous for the environment or human health. For this DEP, the term "very toxic" includes Very toxic-acute, chronic, and environment categories unless otherwise specified. Refer to DEP 01.00.01.30-Gen. Part III for further information regarding toxic fluid classification

1.3.3 Abbreviations

Term	Definition
CBL	Consequential Business Loss
OEM	Original Equipment Manufacturer
PWHT	Post Weld Heat Treatment

1.4 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section or clause number is shown in brackets (). Other documents referenced by this DEP are listed in (4).

1.5 SUMMARY OF MAIN CHANGES

This DEP is a minor revision of the DEP of the same number dated February 2014. The following are the main, non-editorial changes.

Section/Clause	Change
Entire DEP	Restructured and clarified requirements, enforced use of shall/should/may for normative statements.
3.3, Item 1	Clarified the content in the table associated with the DEM1 requirement further.

1.6 COMMENTS ON THIS DEP

Comments on this DEP may be submitted to the Administrator using one of the following options:

Shell DEPs Online (Users with access to Shell DEPs Online)	Enter the Shell DEPs Online system at https://www.shelldeps.com Select a DEP and then go to the details screen for that DEP. Click on the "Give feedback" link, fill in the online form and submit.
DEP Feedback System (Users with access to Shell Wide Web)	Enter comments directly in the DEP Feedback System which is accessible from the Technical Standards Portal http://www.shell.com/standards . Select "Submit DEP Feedback", fill in the online form and submit.
DEP Standard Form (other users)	Use DEP Standard Form 00.00.05.80-Gen. to record feedback and email the form to the Administrator at standards@shell.com .

Feedback that has been registered in the DEP Feedback System by using one of the above options will be reviewed by the DEP Custodian for potential improvements to the DEP.

1.7 DUAL UNITS

This DEP contains both the International System (SI) units, as well as the corresponding US Customary (USC) units, which are given following the SI units in brackets. When agreed by the Principal, the indicated USC values/units may be used.

1.8 NON NORMATIVE TEXT (COMMENTARY)

Text shown in italic style in this DEP indicates text that is non-normative and is provided as explanation or background information only.

Non-normative text is normally indented slightly to the right of the relevant DEP clause.